ANNE LUCEY
SENIOR VICE PRESIDENT FOR
REGULATORY POLICY

CBS CORPORATION

CBS CORPORATION
601 PENNSYLVANIA AVENUE, N.W.
SUITE 540
WASHINGTON, D.C. 20004-2601
(202) 457-4618
FAX: (202) 457-4511
alucey@cbs.com

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September 11, 2008

Ms. Marlene H. Dortch
Secretary
Federal Communications Commission
445 12th Street, SW
Washington DC 20554

FILED/ACCEPTED
SEP 11 2008
Federal Communications Commission
Office of the Secretary

Re: MB Docket 05-312

Dear Ms. Dortch:

On September 9, 2008, the following representatives of the Metropolitan Television Alliance, LLC (MTVA) and its members met with Media Bureau staff to present the results of a field test study on distributed transmission systems in the New York television market commissioned by MTVA: Saul Shapiro, President of MTVA; Margaret Tobey, NBC Universal; Maureen O'Connell, News Corporation; Anne Lucey, CBS Corporation; Preston Padden, The Walt Disney Company; and Tom Van Wazer, the Tribune Company. Media Bureau staff in attendance were: Mary Beth Murphy; Eloise Gore; Barbara Kreisman; Kevin Harding; Clay Pendarvis; John Gabrysch; Evan Baranoff; Nazifa Sawez; and Gordon Godfrey.

Dennis Wallace, of the engineering firm of Meintel, Sgrignoli and Wallace, who conducted the study on behalf of MTVA, presented the results. His presentation is contained in the accompanying disk and attachments.

Please do not hesitate to contact the undersigned for additional information.

Sincerely,

ALucey

cc: (by email w/o disk)
Mary Beth Murphy
Eloise Gore
Barbara Kreisman
Kevin Harding
Clay Pendarvis
John Gabrysch
Evan Baranoff
Nazifa Sawez
Gordon Godfrey

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Metropolitan Television Alliance

Executive Summary

Results of Field Testing

Prototype Distributed Transmission System

New York, NY

As discussed below, the recently completed field testing of a prototype Distributed Transmission System (DTS) has demonstrated that such a network of low power transmitters can be deployed in the New York Metropolitan Area for the purpose of enhancing signals from the main station transmitters to provide a high level of indoor DTV reception capability. This result can increase reception probability and reliability without creating a significant corollary loss of service due to mutual interference. Furthermore, in addition to the service enhancement, the DTS system can provide indoor reception capability in areas where signals from the main transmitters are too weak to provide such service.

Background

The Metropolitan Television Alliance (MTVA) was formed by New York television broadcast stations following the loss of their transmission facilities on the World Trade Center (WTC) as a result of the events of September 11, 2001. The stations were forced into the construction of temporary facilities to restore both analog and digital transmissions. Many of these facilities were constructed on the Empire State Building (ESB).

Following the initial round of restoration projects, it was surmised that the temporary DTV facilities were not performing well in terms replicating the DTV services previously provided from the WTC or even in terms of the analog service then being rendered from ESB.

In particular, it was noted that the UHF antenna on ESB used by six of the stations for DTV broadcasting might have significant short-comings. During this period it also became clear that the replacement structure for the WTC, the Freedom Tower (FT), would not be available for occupancy by the FCC mandated transition date for digital broadcasting and the cessation of analog transmissions (Feb 17, 2009). At that time, it appeared that the Freedom Tower would not be available until sometime in 2011 and the member stations expressed concerns that their digital transmissions after the transition date and prior to relocation to the FT would be seriously compromised.

In order to characterize the service from the various facilities on ESB and elsewhere, MTVA commissioned this firm to perform measurements on the existing stations. Using a helicopter-based platform, the radiation patterns and characteristics of each station were measured and evaluated. That testing program, conducted in 2005, revealed that there were significant distortions of the coverage patterns which were attributed primarily to the short-comings of the physical antenna mountings on ESB. It was further surmised, at the time, that the limitations on making any significant improvements on ESB were such that it was not likely that solutions could be readily effected with a change of antennas or antenna mounting on ESB.

At this time, the use of a Distributed Transmission System was investigated as a possible solution to the degraded performance in areas of Brooklyn, Queens, the Bronx, Staten Island and areas of nearby New Jersey. Of particular concern was the need to replicate the indoor analog reception capabilities then being enjoyed by residents of those areas who were unable to use roof-top antennas and did not have cable or satellite service. At the time, DTS systems were an unproven technology for the 8VSB transmission system adopted for digital transmission in the US. While several prototype systems had been deployed in areas where terrain and/or distance from the transmitter were the service-limiting factors, use of the technology in an urban setting relatively close to the main, high-power transmitters had never been evaluated in a real-world test program.

The principal technical concern at that time was whether a DTS network consisting of on-channel transmitters could be deployed as a system of "gap-fillers" (i.e., filling in the discontinuities in service due to transmitting antenna deficiencies) without receiving or causing significant interference from/to the signals of the "main" transmitters; an important related concern was whether the DTS network low power transmitters would actually provide a sufficiently strong signal to assure good service. Finally, a corollary concern was whether an off-channel model (i.e., using a channel for the DTS other than the channel being used by the primary transmitter in the event that testing determined that the mutual interference between main transmitters and DTS repeaters would be unacceptable) would be viable. It was determined that a field testing program was needed to evaluate these aspects of any proposed DTS network.

A prototype DTS network was designed with the objective of assessing these concerns. For example, an on-channel set of transmitters (on Ch 33) was purposefully deployed in an area where the earlier helicopter-based measurements indicated that a high signal level from the WPIX-DT (Ch 33) transmitter on ESB would be present in order to evaluate the interference issues under "worst case" conditions. Likewise, a set of off-channel transmitters (operating on Channel 65) were deployed in the same area to evaluate the ability to provide indoor reception capability from low power transmitters. A VHF component was added (operating on Ch 12) to assess propagation and service differences between UHF and VHF, if any. Thus, the original prototype network was established with a set of four closely spaced sites in Brooklyn each having 3 DTS transmitters (on Ch 12, Ch 33 and Ch 65).[1/]

To assess the performance of the DTS network in a real-world urban scenario, MTVA commissioned the firm of Mientel, Sgrignoli and Wallace (MSW) to devise and conduct a thorough field testing program which was completed in June 2008. The MSW final report on

[1/] Although not part of the subject matter of this report, it is noted that the off-channel model would require the assignment of significant additional spectrum by the FCC, the probability of which was deemed to be very low. Even if the FCC was so inclined, the availability of spectrum, from a purely technical standpoint, was assessed to be woefully inadequate and, in fact, only two such additional channels could be identified. This would mean that the off-channel model would be limited to a multiplexing arrangement with 5 standard definition digital program streams compressed on each of the two channels to serve each of the participating stations. The lack of high definition service and the obvious spectrum/regulatory issues made this a very undesirable option.

the testing program issued in July 2008 serves as the basis for the comments in this Executive Summary.

Station-Specific Coverage Issues

While several of the MTVA stations employed a common DTV antenna (the CBS UHF antenna) on ESB, some of whom who will also use this antenna (or its replacement) post-transisition, the location and severity of observed coverage short-falls in the metropolitan area vary for each station. This phenomena is related to the fact that the pattern distortions due to antenna mounting issues are directly related to the wavelength of the signal (its operating Channel) and the physical relationship of the antenna to the antenna mounting structure. Thus, pattern "nulls" for one channel may appear in a different area of the coverage pattern than the area(s) affected by nulls produced on a different channel. This complicates the design of a DTS system intended to fill-in the gaps in service caused by the nulls as the siting of gap-fillers for one channel may not be optimal for the same purpose on a different channel. Thus, one approach to the design might be to cover the large area which encompasses all of the short-falls for all of the channels (a blanketing approach) even though it is likely that service would be provided in some areas that already receive acceptable service from the main transmitter. This is the approach that was assumed in the original system design, an approach that predicted a need for at least 20 DTS sites to "cover" the affected areas for all channels under consideration.

Field Test Results

The MSW report is very extensive and addresses the primary issues outlined above. These are

- mutual interference between main and gap-filler transmitters
- service enhancement due to on-channel repeaters
- indoor service (from on-channel and standalone repeaters)

The 128 page report tabulates all of the pertinent measurement results and provides some observations and opinions. The conclusions of the study report are clearly positive with respect to an on-channel DTS system deployment and also demonstrate that a stand-alone (off-channel) model would provide the desired indoor service capability.

It should be noted that during the initial design process, several of the available interference evaluation models were predicting that there would be significant areas of undesired interference created between the DTS transmitters and the "main" ESB transmitter. However, the judgment of several engineers was that the model assumptions would over-predict interference because factors such as the low height of the DTS transmitters and the "clutter effect" of the urban environment on signal propagation were not properly addressed by the programs. The MSW measurement results clearly reflect the validity of these pre-assessments and, although interference was noted in a few scenarios, it can be stated that the predicted widespread destructive interference was not evident. Therefore, it is appropriate to conclude that an on-channel approach (not requiring additional spectrum and capable of full HDTV transmission) can be implemented without creating unmanageable interference issues with proper design.

Of particular concern is the ability of the DTS system to provide indoor reception capability. While the number of sites available for indoor reception evaluation was limited, the results are positive. Notably, the standalone Channel 65 transmitters were able to provide indoor service in 90% of the scenarios tested inside the primary service area, a result not surpassed by either the main transmitter alone or the main transmitter augmented by the on-channel DTS transmitters. This validates both the available signal strength from the low power transmitters and the propagation resulting from relatively low antenna siting, essentially removing these concerns. It is also important to note that this also "proves" that the DTS transmitters will provide indoor reception in areas where the signals from the main transmitter are weak or non-existent.

Finally, there is the question of service availability improvement due to the addition of the on-channel DTS signals to the main transmitter signals. It is noted that the average improvement with the DTS signals complementing the main signals was 6dB. This is equivalent to increasing the main transmitter power by a factor of 4 (for example, increasing the effective radiated power from 250 kW to 1,000 kW/1 Megawatt). Recalling that, in general, the area selected for the test network was an area of high predicted signal strength for the main transmitter (WPIX-DT, Ch 33) based on the earlier measurements, this is a very significant outcome. In fact, the average improvement in indoor reception capability with the DTS enhancement was 33% within the network's primary area.

While the relatively small number of indoor sites available for testing might raise some concerns about statistical validity, when coupled with the statistically valid body of outdoor reception test data, it can be concluded that a DTS network will perform more than adequately as a "gap-filling" system and will provide signal margins comparable to that which would have been provided by a properly functioning ESB facility which will greatly increase the probability of reception and the reliability[2/] of that reception.

One anomaly revealed by the field testing is the relatively poor indoor performance of the VHF portion (Ch-12) of the DTS network vis-a-vis its UHF counterparts. This result is being further investigated and, therefore, for the purposes of this report, the conclusions and observations are applicable only to the DTV stations operating in the UHF band.

Conclusion

As noted above, the field test results clearly indicate that the role of a DTS system as a "gap-filler" in this difficult urban environment has been adequately demonstrated. It has also been noted that the location of the gaps in service will vary from station-to-station depending upon the particular antenna configuration and performance aspects of each. Therefore, the final design of a system which serves several stations must take a wide-area approach which

[2/] While the MSW report correctly notes that the time-variability of the test signals was not evaluated, high signal margins, as observed during the tests, are the principal factor in mitigating the deleterious effects of signal variability with time.

unavoidably will duplicate service in some areas but which will also significantly increase the probability of reception. The exact configuration of a final design will depend primarily on budgetary constraints and, perhaps, by any improvements in service that may result from the installation of the new multi-station CBS antenna.

John F.X. Browne, PE
July 21, 2008

MTVA Distributed Transmission Project

Presentation of Project Overview

&

Results of Field Testing

Presented to the

Federal Communications Commission

September 9, 2008

Meintel, Sgrignoli, & Wallace

Overview

- ☐ NYC DTV Service Problem Description
- ☐ Possible DTx Solution
- ☐ DTx Prototype Network Description
- ☐ DTx Field Testing Plan
- ☐ Results of Field Testing
- ☐ Questions & Answers

Overview - MTVA

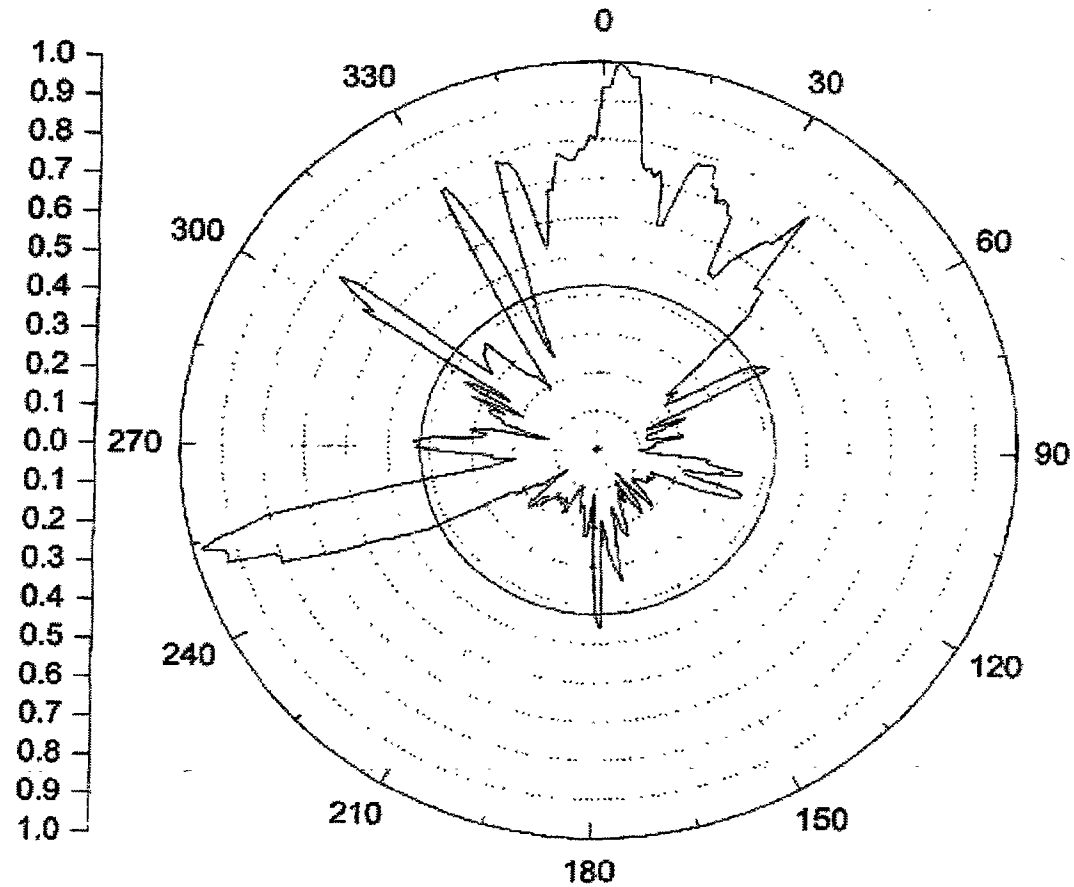
- MTVA- Metropolitan Television Alliance
  - NY TV Stations that lost their primary transmitter site at WTC on 9/11
  - 11 Television Stations in MTVA
  - Currently relocated to Empire State Building
  - ESB Antenna Shortcomings=Loss of Service
  - Focus on *indoor* reception in anticipation of Feb 17, 2009

ESB Site DTV Antenna Coverage

- DTV Antenna Side Mounted to Mooring Mast Structure & Lower Height
- Large Mooring Mast Structure creates "shadow" over areas in Brooklyn
- "Omni" Antenna isn't "Omni" when mounted to ESB Structure
- Potential for loss of service areas when compared with Analog Service from former site at WTC

Measured "Omni" Antenna Pattern

WPIX-DT Ch. 33



Red Circle is the RMS Value of the Pattern = 0.423

Meintel, Sgrignoli, & Wallace

DTS Network – Possible Solution

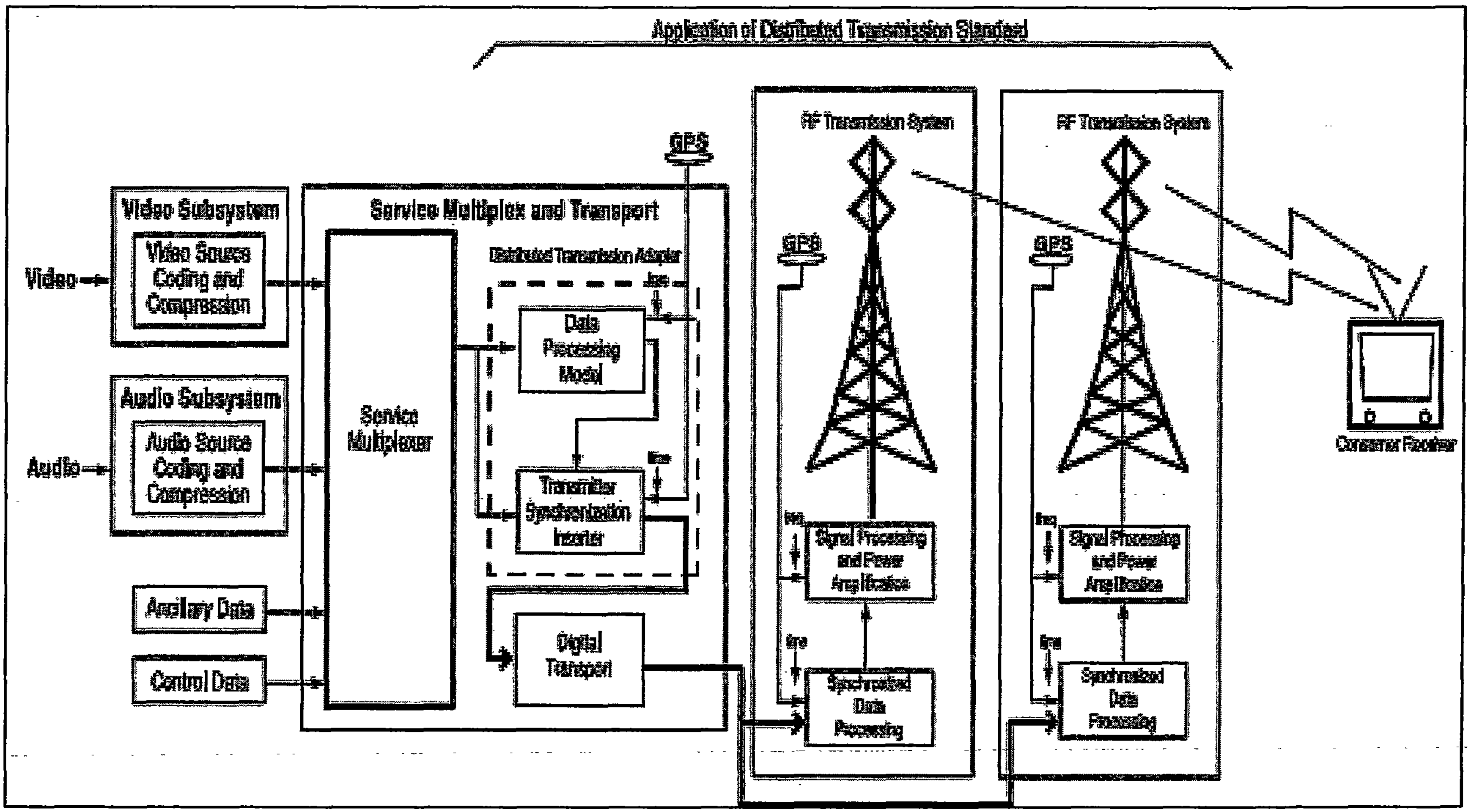
- ☐ Coverage (Field Strength) Evenly Distributed Throughout Market
- ☐ Improved Outdoor & <u>Indoor</u> Service
- ☐ Antenna Orientation
  - Less Critical
  - Ease of User Adjustment ("Ease of Use")
  - Simple Low Profile Antennas
- ☐ Smaller Transmitters

Meintel, Sgrignoli, & Wallace

DTx Network Overview

- On the Same RF Channel
- Synchronized Transmitters
  - Carrier Frequency
  - Symbol Clock
  - Delay – Timing
  - Data Symbols (Trellis synched)
- A/110 ATSC Standard System
- A/111 ATSC Recommended Practice
- RF Watermark for each Transmitter

Basic DTx System Overview



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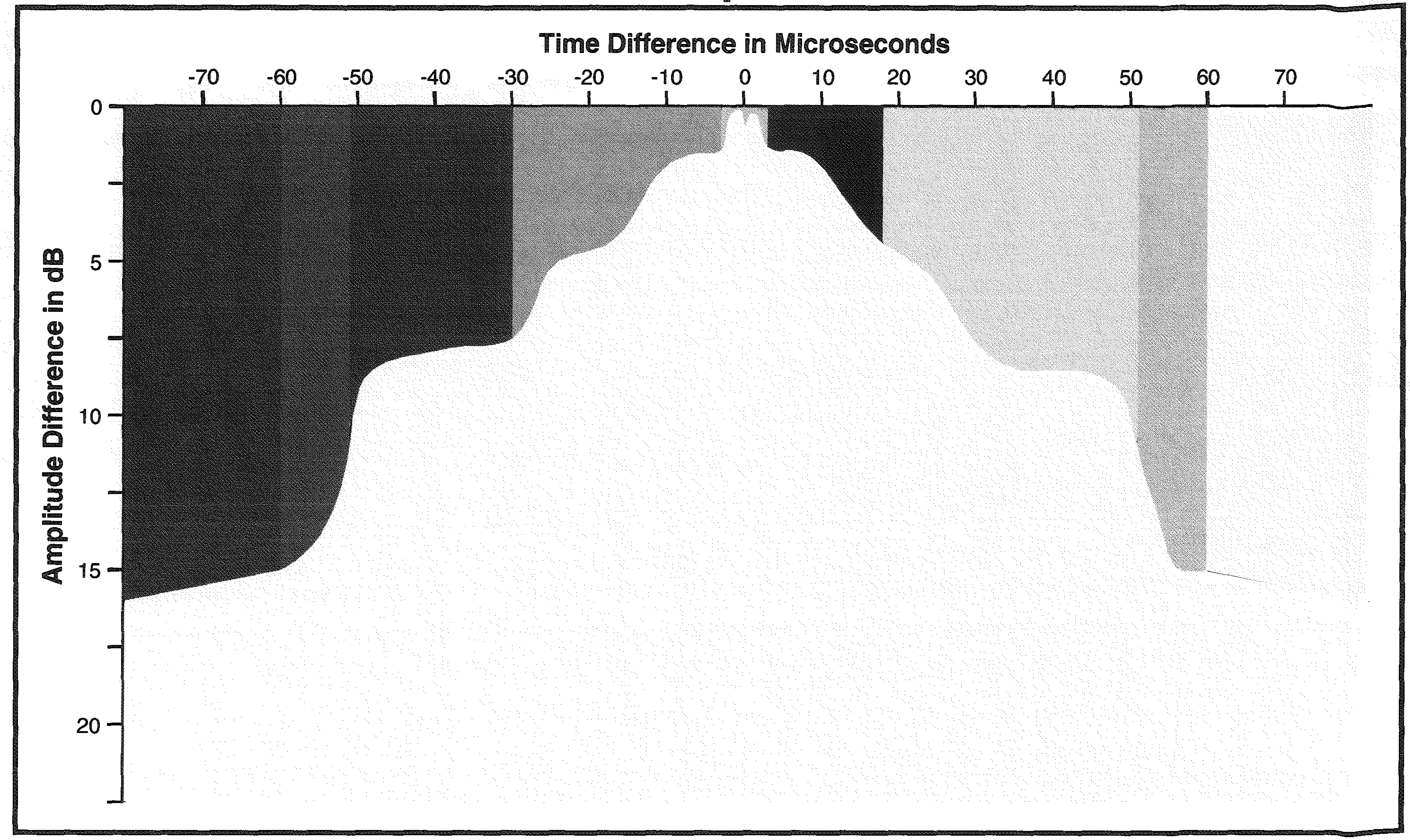
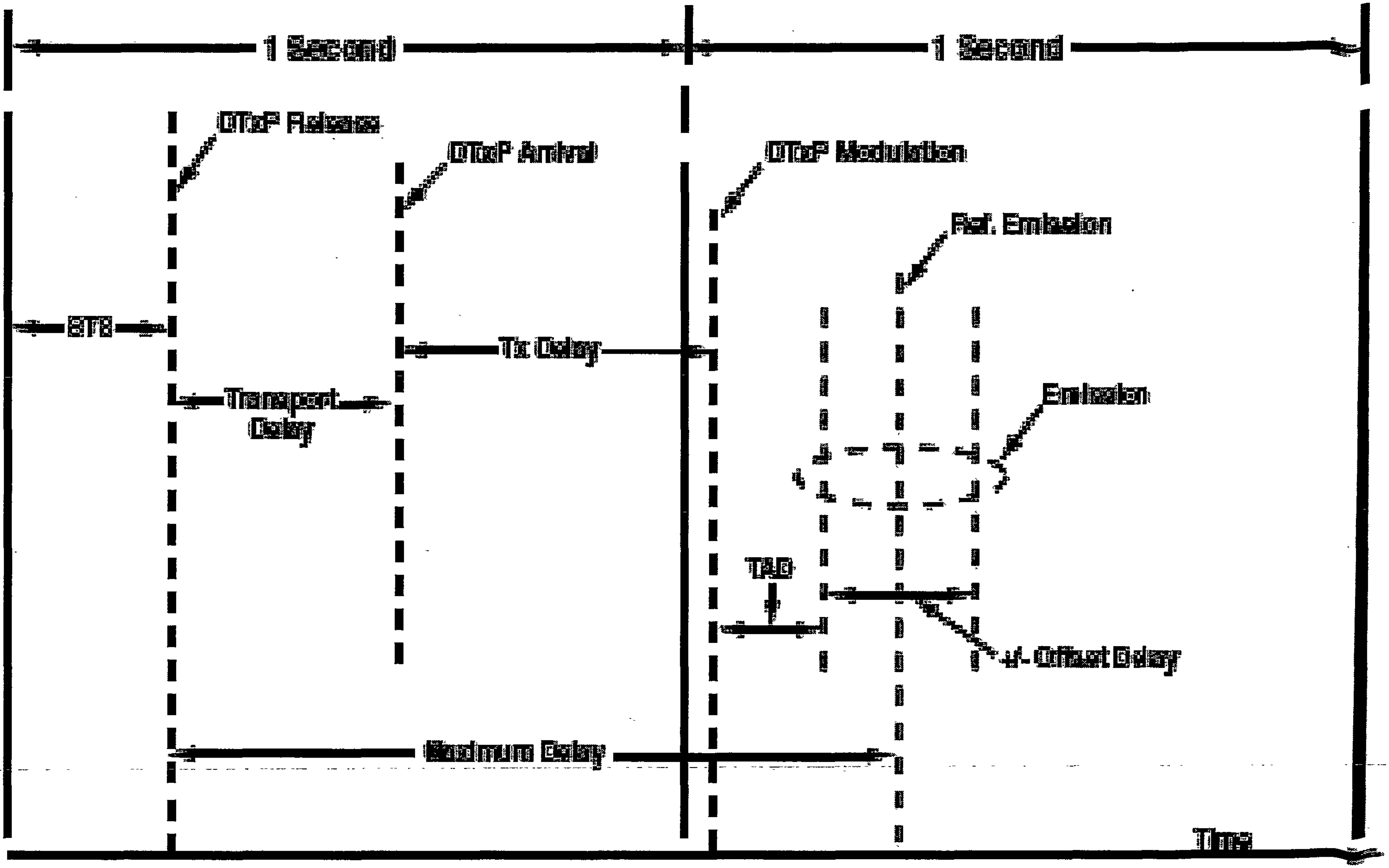
DTx Transmission System – Induced "Self" Interference

- Multiple Transmitter signals arrive at the DTV Receiver at different times.
  - Creates "Ghosts" or Multipath from system induced signals.
  - DTV Receiver attempts to equalize these impairments.
  - DTV Receiver's ability to equalize the impairments is limited
  - Must also equalize "Naturally" occurring impairments.
  - Amplitude of Ghost correction is reduced with longer delays relative to "Main" signal.

5th Gen. Rx Equalizer Mask



Basic DTx Timing Control



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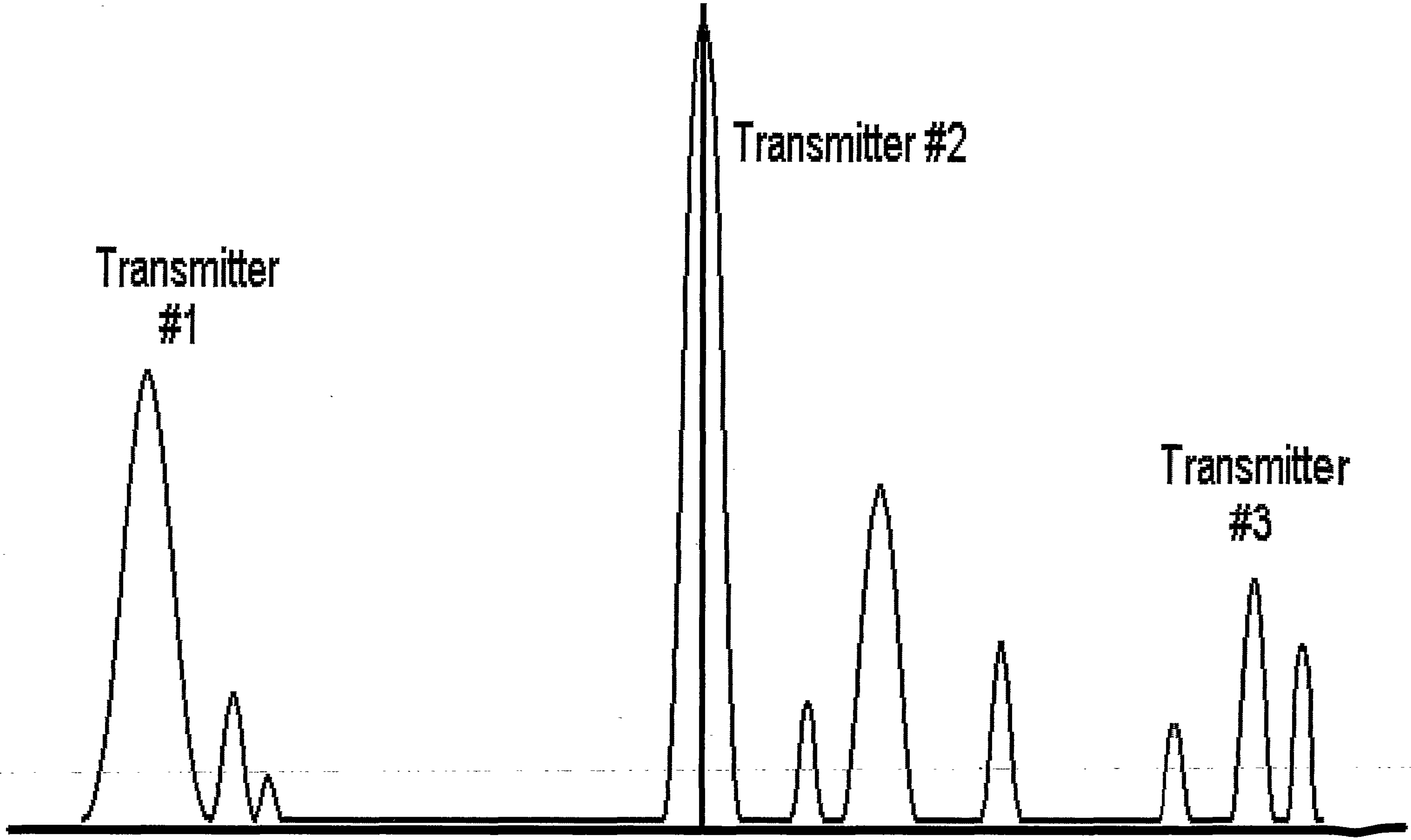
TxID Receiver (RF Watermark)



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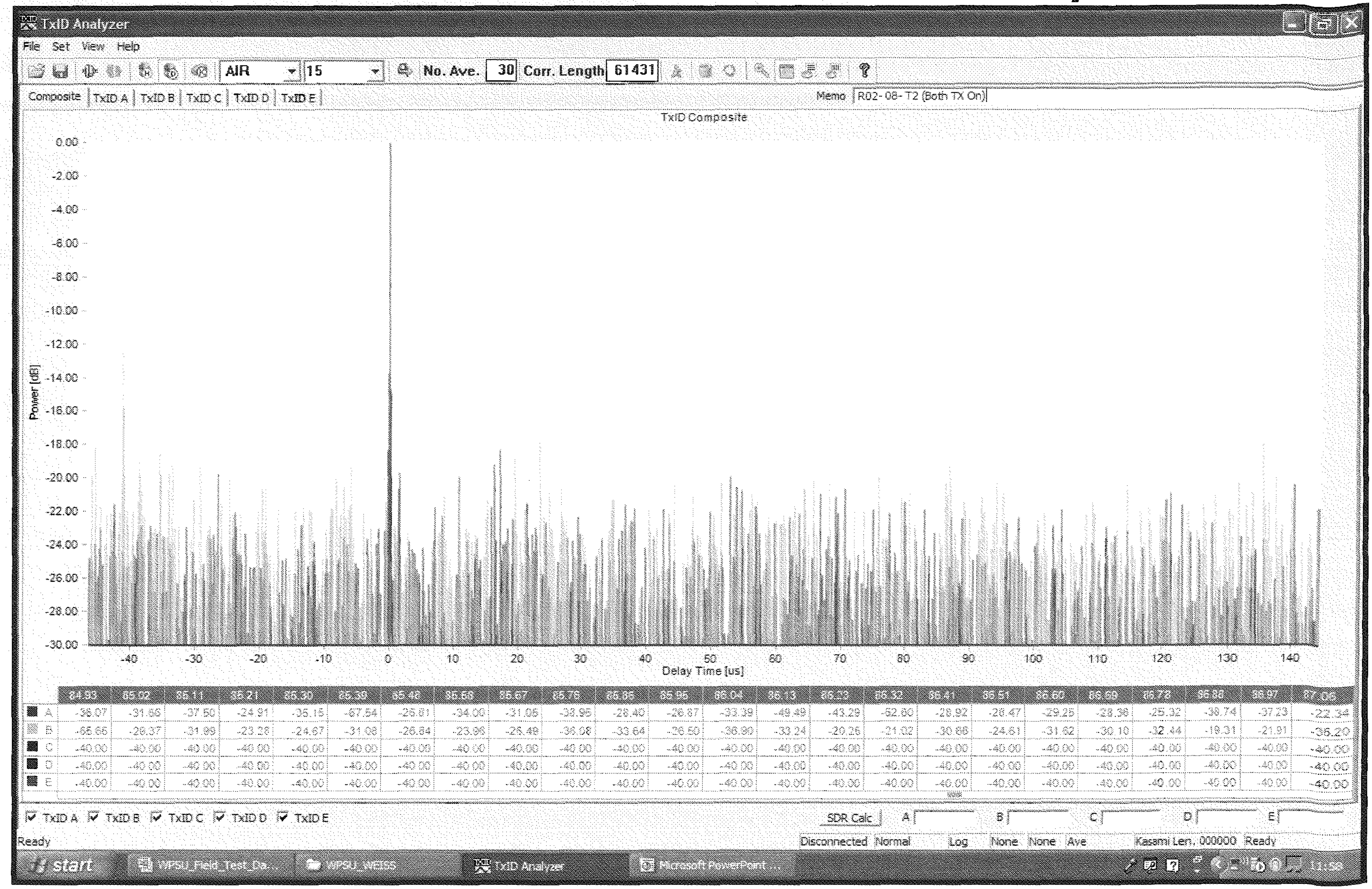
RF Watermark –TXID Analyzer



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MTVA DTS Project - Participants

- Altan Stalker and Paul Puccio MTVA Consulting Engineers
- MTVA Member's Broadcast Engineers
- John F.X. Browne – Consulting Engineer for MTVA
  - DTS System Design
  - DTS System Licensing – FCC Authorizations
  - DTS System Timing Design and Setup
- Merrill Weiss – Peer Review of Project
  - Review of System Design
  - Review of Field Testing Plan
- Axcera –Equipment Manufacturer & Turn-Key Systems Provider
  - Supply Transmitting Equipment, Site Layouts
  - Contract Permits, Electrical, Telephone, Antennas, µWave
- Bob Tarsio- Broadcast Devices – Project Construction Manager
  - Manage Site Acquisition and Build-Out

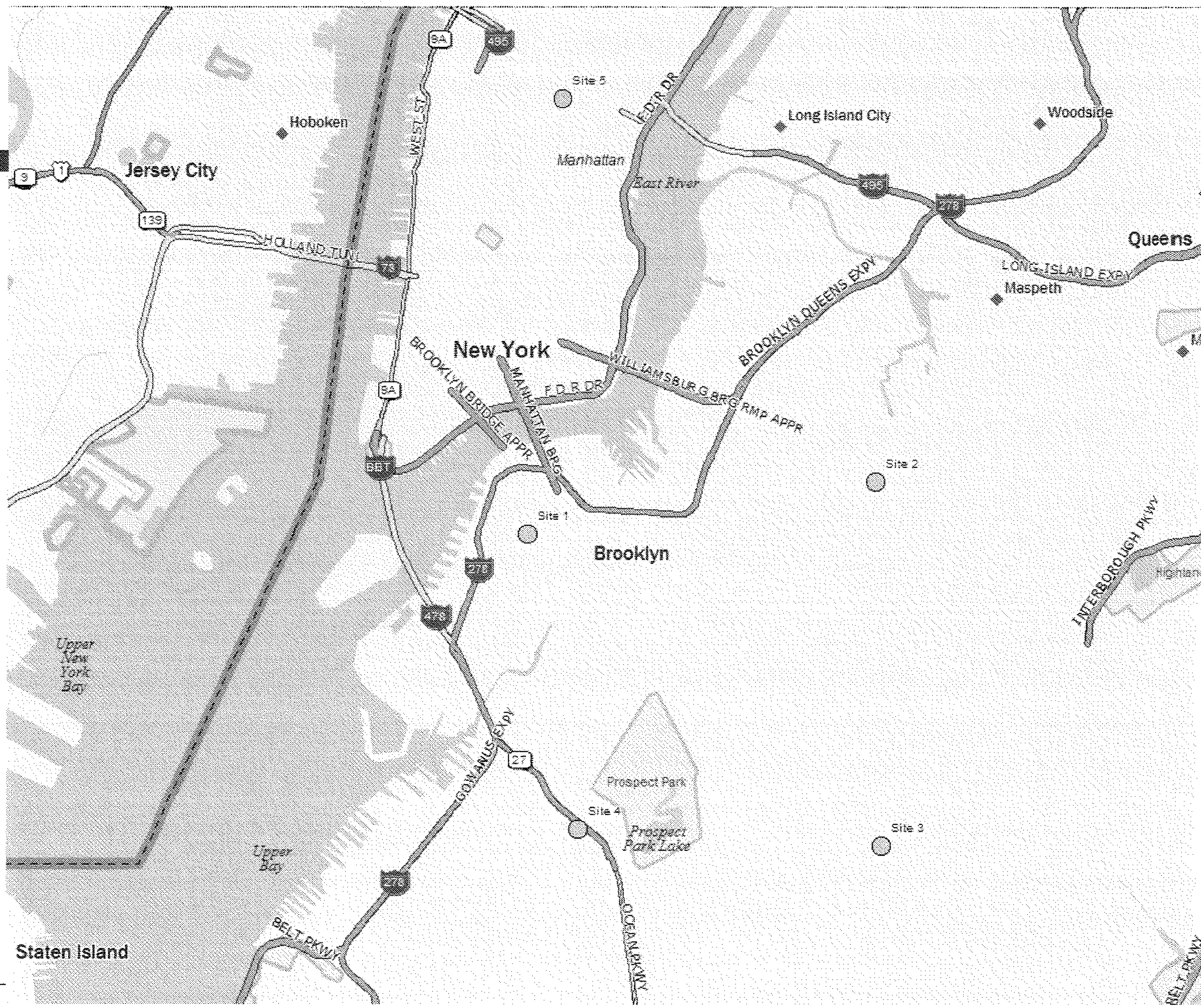
MTVA Project - Participants

- Meintel, Sgrignoli, & Wallace- MTVA Consultants
  - CECB Program Comments
  - Indoor Antenna Survey
  - Indoor Antenna Measurements
  - 5G Receiver Lab Test
  - Development of Indoor Planning Factors
  - Development of Field Test Plan
  - Field Measurements
  - Data Analysis & Field Test Report

MTVA DTx Project Overview

- Prototype DTx Network Built in Brooklyn and Queens
- 4 DTx Sites within the area of interest
- Channel 12, 33, & 65
- WPIX-DT Channel 33 at ESB
- Channel 12 Experimental at ESB
- Channel 65 Only 4 DTx Transmitters
- DTx Transmitters 1KW ERP
- Panel Antenna Channel 12 All Sites
- Slot Antennas Channel 33 & 65
  - Except Site 3 - Channel 33 & 65 Panel Antennas

Prototype DTx System Transmitter Site Locations



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